

**THE INSTITUTE OF MATHEMATICS AND ITS
APPLICATIONS**

IMANA NEWSLETTER

**Newsletter of the Numerical Analysis Group of the
Institute of Mathematics and its Applications**

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1 Happy New Year

Many thanks to all those who have contributed to the Newsletter over the past year. Please continue to send news items that you feel will be of interest to the UK NA community. The copy date for the next Newsletter will be **Friday 1st April**. As always, contributions from individuals as well as groups/departments are very welcome. Please use the newsletter as an opportunity to tell the community about NA-related activities in the UK.

With best wishes for 2011.

Jennifer Scott (jennifer.scott@stfc.ac.uk)
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 Rutherford Appleton Laboratory, Didcot, Oxfordshire OX11 0QX

2 2010 International Review of Mathematics

Following the recent EPSRC International Review of Mathematical Sciences held during the week 5-10 December 2010, there will be a public launch of the Review Panel report and findings at a 'Town Meeting' which will be held on Friday 28 January 2011 at the University of London, Senate House, Malet Street, London, WC1E 7HU. The meeting will commence at 13:30 with registration and will finish at approximately 16:30 with tea and refreshments.

The meeting will include a presentation of the report of the Review Panel and a discussion of the findings, in order to begin development of an action plan to take the recommendations forward.

The International Review Panel's report will be presented by the Chair of the Review, Professor Margaret Wright (New York University, USA), and copies of the report will be available shortly before the meeting. An agenda will also be available nearer the time. The panel's recommendations form an integral part of EPSRC's planning process, informing future key priorities.

The closing date for registering to attend the Town Meeting is 19 January 2011. Places are very limited so an early response is advised. Questions may be addressed to Kate Bowering (tel: 01793 444043).

3 Leslie Fox Prize 2011

The Fifteenth Leslie Fox Prize meeting will take place on 27 June 2011, in the Manchester Institute for Mathematical Sciences at The University of Manchester.

Entries for the Fifteenth Leslie Fox Prize competition should be submitted by 31 January 2011. Any person who is less than 31 years old on 1 January 2011 and has not already won a first prize is eligible. Each entry should consist of a paper, describing some of the candidate's research, that is suitable for a 40 minute lecture at a numerical analysis meeting.

The entries will be considered by an Adjudicating Committee comprising Mark Ainsworth (Strathclyde), Nick Gould (Rutherford Appleton Laboratory) and Nick Higham (Manchester, Chairman).

Full details of the prize, and the submission procedure, may be found at
<http://www.mims.manchester.ac.uk/events/workshops/FOX2011>

4 Workshop Report

11th European Workshop on Automatic Differentiation

This meeting was held on 9 December 2010 at Cranfield University's Shrivenham Campus. It was attended by around 20 delegates from industry and academia.

The meeting's first session concerned automatic differentiation (AD) in the Matlab problem solving environment. The host, Shaun Forth, reviewed AD techniques for sparsity detection - determining the positions of non-zero entries in a function's Jacobian - before outlining two implementations he and intern student Anand Chaturvedi have developed. Asgeir Birkisson of Oxford University then gave a fascinating

talk on automatic Frechet differentiation of functions and its implementation and application in the Chebfun package. Cranfield's Cosmin Bocaniala spoke on using AD in a gradient-enabled modification of the Particle Swarm Optimization heuristic - a topic visited again later in the day in David Toal's presentation.

In a more theoretically-focussed second session, Paul Hovland of Argonne National Laboratory spoke on an integer programming formulation of the vertex elimination problem with the aim of minimising the number of floating point operations required to compute a function's Jacobian. Kshitij Kulshreshtha of Paderborn University then described his work on the required precision of univariate elemental functions in AD required to stably compute a function's derivatives.

The afternoon session was targeted at applications in computational engineering. We were fortunate to have Vassili Srithammavanh of EADS Innovation Works in France describe some first experiments in applying AD to some inverse problems in aerospace applications - fortunate both in having a fascinating industrially focussed talk and that Vassili had taken the trouble to battle through Northern Europe's weather disrupted transport infrastructure to attend. Southampton University's David Toal then introduced the audience to the intricacies of surrogate modelling in engineering design, in particular the kriging approach, and then presented his group's use of an adjoint formulation to enable gradient-enabled optimisations of such design models. Dominic Jones of Queen Mary College, London, then described some of the problems and issues he had encountered in applying AD to CFD solvers. Dominic's humour gloriously exposed areas in which AD tools must improve to enable application to larger projects without extensive user expertise.

The many questions, answers and discussions provoked by the presentations indicate that this workshop was a success - thank you to all who participated and to NAG for their generous financial support.

Shaun Forth

5 Who's Visiting Whom

Cambridge

Dr Karolina Kropielnicka, University of Gdansk, is visiting for the academic year 2010/11. Her interests are in delay differential equations and high oscillation. Contact: A. Iserles (A.Iserles@damtp.cam.ac.uk).

Oxford

Ivo Panayotov and David Titley-Peloquin, both from McGill University, Canada are visiting post-docs for 1 year (Panayotov) / 2 years (Titley-Peloquin), starting in October 2010. They are working with Dr. Andy Wathen and Prof. Nick Trefethen.

6 Technical Reports

University of Bath

BICS reports: Available from <http://www.bath.ac.uk/math-sci/bics/preprints/>

10/10 Analysis of planewave methods for photonic crystal fibres.
Richard Norton and Robert Scheichl.

Brunel University

Reports available from http://people.brunel.ac.uk/~icsrssi/bicom/tech_rep.html

University of Cambridge

Reports available from <http://www.damtp.cam.ac.uk/user/na/reports.html>

- NA2010/10 B. Adcock and A. C. Hansen.
Stable reconstructions in Hilbert spaces and the resolution of the Gibbs phenomenon.
- NA2010/09 A. Boettcher, S. Grudsky and A. Iserles.
Spectral theory of large Wiener–Hopf operators with complex-symmetric kernels and rational symbols.
- NA2010/08 A. Boettcher, S. Grudsky, D. Huybrechs and A. Iserles.
First-order trace formulas for the iterates of the Fox–Li operator.

University of Edinburgh

Reports available from <http://www.maths.ed.ac.uk/ERGO/preprints.html>

- ERGO 10-002 P.Gonzalez-Brevis, J. Gondzio, Y. Fan, H.V. Poor, J. Thompson, I. Krikidis and P.-J. Chung.
Base station location optimization for minimal energy consumption in wireless networks.
- ERGO 10-003 A. Grothey and X. Yang.
Solving the top-percentile traffic routing problem by approximate dynamic programming.
- ERGO 10-004 J. Gondzio.
Interior point methods in machine learning.
- ERGO 10-005 C. Cartis, N.I.M. Gould and Ph.L. Toint.
On the oracle complexity of first-order and derivative-free algorithms for smooth nonconvex minimization.
- ERGO 10-006 C. Cartis, N.I.M. Gould and Ph.L. Toint.
Evaluation complexity of adaptive cubic regularization methods for convex unconstrained optimization.
- ERGO 10-007 C. Cartis, N.I.M. Gould and Ph.L. Toint.
Complexity bounds for second-order optimality in unconstrained optimization.

University of Liverpool

Reports available from http://www.liv.ac.uk/~cmchenke/na_liverpool.htm

University of Manchester

MIMS EPrints from <http://www.manchester.ac.uk/mims/eprints>

Preprints with AMS Mathematics Subject Classification 65: Numerical Analysis.

- 2010.99: Timo Betcke, Nicholas J. Higham, Volker Mehrmann, Christian Schröder and Françoise Tisseur.
NLEVP: A Collection of Nonlinear Eigenvalue Problems. Users' Guide.
- 2010.98: Timo Betcke, Nicholas J. Higham, Volker Mehrmann, Christian Schröder and Françoise Tisseur.
NLEVP: A Collection of Nonlinear Eigenvalue Problems.
- 2010.94: Bruno R. C. Magalhaes, Nicholas J. Dingle and William J. Knottenbelt.
GPU-enabled steady-state solution of large Markov models. In: 6th International Workshop on the Numerical Solution of Markov Chains (NSMC'10), 16-17 Sep 2010, Williamsburg, Virginia.

2010.91: Nicholas J. Higham and Lijing Lin.
A Schur–Pade Algorithm for Fractional Powers of a Matrix.

2010.88: Alexei Besspalov and Norbert Heuer.
Natural hp-BEM for the electric field integral equation with singular solutions.

Oxford University

Reports available from <http://eprints.maths.ox.ac.uk/view/groups/nag/>

NA-10/09 Peter Giesl and Holger Wendland.
Numerical determination of the basin of attraction for exponentially asymptotically autonomous dynamical systems.

NA-10/10 Daniela Schraeder and Holger Wendland.
An extended error analysis for a meshfree discretization method of Darcy’s problem.

NA-10/11 Quoc T Le Gia, Ian H Sloan, and Holger Wendland.
Multiscale RBF collocation for solving PDEs.

NA-10/12 Holger Wendland.
A high-order approximation method for semilinear parabolic equations on spheres.

NA-10/13 Martin Stoll and Andrew J Wathen.
All-at-once solution of time-dependent PDE-constrained optimization problems.

NA-10/14 John W Pearson and Andrew J Wathen.
A New Approximation of the Schur Complement in Preconditioners for PDE Constrained Optimization.

NA-10/15 Asgeir Birikisson and Tobin A. Driscoll.
Automatic Frechet differentiation for the numerical solution of boundary-value problems.

University of Reading

Preprints available from <http://www.reading.ac.uk/math-and-stats/research/math-preprints.aspx>

MPS_2010_31 Velocity-based moving mesh methods for nonlinear partial differential equations.
M.J. Baines, M.E. Hubbard and P.K. Jimack.

MPS_2010_32 Communicability Across Evolving Networks.
Peter Grindrod, Desmond J. Higham, Mark C. Parsons and Ernesto Estrada.

MPS_2010_33 NLEVP: A Collection of Nonlinear Eigenvalue Problems.
Timo Betcke, Nicholas J. Higham, Volker Mehrmann, Christian Schrder and Françoise Tisseur.

Rutherford Appleton Laboratory

Reports available from <http://www.numerical.rl.ac.uk/reports/reports.shtml>

RAL-P-2010-001 I. S. Duff, K. Kaya and B. Ucar.
Design, implementation, and analysis of maximum transversal algorithms.

RAL-TR-2010-031 J. D. Hogg and J. A. Scott.
A modern analyse phase for sparse tree-based direct methods.

- RAL-TR-2010-030 C. Cartis, N. I. M. Gould and Ph. L. Toint.
Evaluation complexity of adaptive cubic regularization methods for convex unconstrained optimization.
- RAL-TR-2010-029 C. Cartis, N. I. M. Gould and Ph. L. Toint.
On the oracle complexity of first-order and derivative-free algorithms for smooth nonconvex minimization.

7 Diary of Seminars (January - March 2011)

BATH Numerical Analysis Seminars: Seminars take place on Fridays at 12:15pm in Department of Mathematical Sciences, Building 4 West, Room 4W1.7 (Wolfson Lecture Theatre). The timetable is available at <http://people.bath.ac.uk/~mamamf/naseminar.html>

BIRMINGHAM : The Optimisation and Numerical Analysis seminar at Birmingham run on Thursdays, between 12-1pm in Arts Lecture Room 6, Edgbaston Campus at the University of Birmingham. The programme can be found at <http://web.mat.bham.ac.uk/loghin/onaseminars.html>

BRUNEL : Two seminar series are held in the Department of Mathematical Sciences, John-Crank Building, Room M128. The Applied Mathematics Research Seminars take place on Mondays at 14:00, and the Seminars on Mathematical Physics and Random Matrices are held on Tuesdays at 16:00. More details are available at <http://www.brunel.ac.uk/about/acad/siscm/maths/events>

CARDIFF : Seminars take place on Tuesdays at 4pm in School of Mathematics room M/2.06. Contact: Tim Phillips (phillipstn@cf.ac.uk).

CAMBRIDGE : There are two relevant (usually fortnightly) Cambridge seminars: the Numerical Analysis seminar and the Applied and Computational Analysis seminars, usually on Thursdays at MR14 (Pavilion F). Up-to-date list of ACA seminars lives at <http://talks.cam.ac.uk/show/index/9811>.

DURHAM : Durham NA seminars take place by default on Fridays at 14:15 in E102, but interested visitors should confirm the time and location with Abigail Wacher (abigail.wacher@durham.ac.uk) beforehand.

EDINBURGH : The Edinburgh Research Group in Optimization (ERGO) runs seminars on Optimization and Numerical Analysis. Seminars are usually on Wednesdays at 3.30pm in Room 6206 of the James Clerk Maxwell Building. More details are available from: <http://www.maths.ed.ac.uk/ERGO/seminars.html>

LIVERPOOL : Seminars are normally held on Wednesdays at 4pm, in the Whittaker Room (211), Mathematical Sciences Building.
See <http://www.liv.ac.uk/maths/Applied/Research/Seminars/index.html>

MANCHESTER : Numerical Analysis and Scientific Computing Seminars are held in the in the Alan Turing Building, Frank Adams Room 1, at 3pm. For more details and abstracts, see <http://www.mims.manchester.ac.uk/events/seminars/numerical-analysis.php>

OXFORD : Unless stated otherwise, seminars take place on Thursdays at 2pm in the Seminar Room RI.0.48, Gibson Building. For further information contact Lotti Ekert (Lotti.Ekert@maths.ox.ac.uk). A timetable and abstracts are available from <http://www.maths.ox.ac.uk/events/seminars/>

RAL : Seminars are held in the Atlas Centre, Rutherford Appleton Laboratory and start at 2pm.
Contact: sue.thorne@stfc.ac.uk

READING : Seminars take place on Fridays promptly at 4pm in room 113 of the Mathematics

Department. External audiences are advised to contact Brigitte Calderon on 0118 378 5002 or email b.calderon@reading.ac.uk to confirm the programme before attending.

Please note that, at the time of writing, not many people had fully sorted out their seminar series for this coming term (a lot of titles are not yet available) so you are advised to check the given websites for details of titles and of further seminars as they become available.

JANUARY 2011

JANUARY 13 : OXFORD. Chris Budd (University of Bath). TBA.

JANUARY 17 : READING. Lyonell Boulton (Heriot-Watt).

On the limit of second order spectra and the eigenvalues of self-adjoint operators.

JANUARY 18 : CARDIFF. Rob Scheichl (University of Bath).

Multilevel Simulation under Uncertainty

JANUARY 20 : OXFORD. Sebastien Loisel (Heriot-Watt University).

Optimized domain decomposition methods that scale weakly.

JANUARY 27 : RAL. David Titley-Peloquin (Oxford University). TBA.

JANUARY 28 : MANCHESTER. Andrew Stuart (University of Warwick).

An Elliptic Inverse Problem From Groundwater Flow.

JANUARY 31 : READING. Reading Distinguished Colloquium. Jon Keating, FRS (Bristol).

Random Matrices and Number Theory.

FEBRUARY 2011

FEBRUARY 3 : OXFORD. Des Higham (University of Strathclyde).

Algorithms for Evolving Networks.

FEBRUARY 4 : DURHAM. John Ball (Oxford University). TBA.

FEBRUARY 7 : READING. Marco Marletta (Cardiff).

Approximating the spectra of self-adjoint and dissipative operators.

FEBRUARY 8 : CARDIFF. Jie Li (University of Cambridge). TBA.

FEBRUARY 11 : MANCHESTER. David Titley-Peloquin (Oxford University). TBA.

FEBRUARY 11 : DURHAM. Arieh Iserles (University of Cambridge). TBA.

FEBRUARY 14 : READING. Reading Distinguished Colloquium. Wolfgang Wendland (Stuttgart).
TBA.

FEBRUARY 15 : CARDIFF. Rich Kerswell (University of Bristol). TBA.

FEBRUARY 17 : OXFORD. Raymond Spiteri (University of Saskatchewan).

Stiffness analysis of cardiac cell models.

FEBRUARY 21 : READING. Alexander Pushnitski (Kings College London).

Asymptotics of eigenvalue clusters of the perturbed Landau Hamiltonian.

FEBRUARY 24 : OXFORD. Juan Vera (Tilburg University).

Iterative Valid Polynomial Inequalities Generation for Polynomial Programming.

FEBRUARY 25 : DURHAM. Anotida Madzvamuse (University of Sussex). TBA.

FEBRUARY 28 : READING. Alexander Balinsky (Cardiff).

Variational PDE Models in Image Processing.

MARCH 2011

MARCH 3 : OXFORD. Selin Damla Ahipasaoglu (London School of Economics)
Analytical Results on the PAUSE Auction Procedure.

MARCH 10 : RAL. David Silvester (University of Manchester). TBA.

MARCH 11 : DURHAM. Sergio Campobasso (University of Glasgow). TBA.

MARCH 18 : MANCHESTER. Olivier Le Maître (LIMSI-CNRS, Orsay, France). TBA.

MARCH 21 : READING. Alexandre Girouard (Neuchatel). TBA.

MARCH 22 : CARDIFF. Simon Cox (Aberystwyth).
Simulating the Bubble Scale Rheology of Foams.

8 Forthcoming Meetings and Conferences**JANUARY 2011****Numerical Analysis and Optimization: Theory, Algorithms, Applications and Technology Transfer, January 3 - 6.**

Sultan Qaboos University, Muscat, Oman.

<http://www.squ.edu.om/Portals/87/Conference/Conference2011/index.htm>

SIAM UK/IE Meeting, January 7.

Turing Building, University of Manchester. <http://www.personal.reading.ac.uk/~sp900945/siamukie>.

FEBRUARY 2011**SIAM Conference on Computational Science and Engineering (CSE11), February 28 - March 4.**

Grand Sierra Resort and Casino, Reno, Nevada, USA. <http://www.siam.org/meetings/cse11/>

MARCH 2011**35th South African Symposium on Numerical and Applied Mathematics (SANUM 2011), March 23 - 25.**

University of Stellenbosch, Cape Town, South Africa. <http://dip.sun.ac.za/sanum/>

Copper Mountain Conference on Multigrid Methods, March 27 - April 1.

Copper Mountain, Colorado. <http://grandmaster.colorado.edu/~copper/2011/>

APRIL 2011**19th High Performance Computing Symposium (HPC 2011), April 3 - 7.**

Boston, USA. <http://www.cs.vt.edu/hpc2011/>

7th International Conference on Modelling in Industrial Maintenance and Reliability, April 17 - 19.

Cambridge. http://www.ima.org.uk/Conferences/7th_mimar/index.html

MAY 2011**3rd International Conference on Finite Element Methods in Engineering and Science (FEMTEC 2011), May 9 - 12.**

South Lake Tahoe, USA. <http://hpfem.org/events/femtec-2011/>

Third Conference on Applied, Computational and Industrial Mathematics (MACI 2011), May 9 - 11.

Bahia Blanca, Argentina. <http://asamaci.unsl.edu.ar/maci2011e/index.html>

**7th International Conference on Preconditioning Techniques (Precond'2011),
May 16 - 18.**

Bordeaux, France. <http://precond11.bordeaux.inria.fr>

SIAM Conference on Optimization, May 16 - 19.

Darmstadt, Germany. <http://www.siam.org/meetings/op11/>

PCO'11 Parallel Computing and Optimization, May 16 - 20.

Anchorage, Alaska. <http://www.ipdps.org>

International Symposium in Approximation Theory, May 17 - 21.

Nashville, Tennessee. www.math.vanderbilt.edu/~Nashville201

Fifth SIAM Workshop on Combinatorial Scientific Computing, May 19 - 21.

Darmstadt, Germany. <http://www.siam.org/meetings/csc11/>

12th IEEE International Workshop on Parallel and Distributed Scientific and Engineering Computing, May 20.

Anchorage, Alaska. <http://cse.stfx.ca/~ltyang/ipdps11-pdsec>

JUNE 2011

**Seventh International Conference on Large-Scale Scientific Computations,
June 6 - 10.**

Sozopol, Bulgaria. <http://parallel.bas.bg/Conferences/SciCom11.html>

International Symposium on Symbolic and Algebraic Computation (ISSAC), June 8 - 11.

San Jose, California. <http://www.issac-conference.org/2011/>

Householder Symposium XVIII, June 12 - 17.

Tahoe City, California. <http://crd.lbl.gov/SCG/HH11/>

3rd Conference AMiTaN11, June 20 - 25.

Albena, Bulgaria. <http://2011.eac4amitans.org>

33rd International Conference on Boundary Elements and other Mesh Reduction Methods (BEM/MRM 33), June 28 - 30.

Ashurst Lodge, New Forest, UK. <http://www.wessex.ac.uk/bem2011>

24th Biennial Conference on Numerical Analysis, June 28 - July 1.

Strathclyde University, Glasgow. <http://www.mathstat.strath.ac.uk/naconf>

JULY 2011

Foundations of Computational Mathematics, July 4 - 14.

Budapest. <http://www.damtp.cam.ac.uk/user/na/FoCM11/>

IMA Conference on Nonlinearity and Coherent Structures, July 6 - 8.

Reading, UK. <http://www.ima.org.uk/Conferences/ncs/index.html>

ICIAM 2011, July 18 - 22.

Vancouver, BC, Canada. <http://www.iciam2011.com/>

Optimization 2011, July 24 - 27.

Lisbon (Caparica), Portugal. <http://www.fct.unl.pt/optimization2011>

SIAM Conference on Control and Its Applications (CT11), July 25 - 27.

Baltimore, Maryland, USA. <http://www.siam.org/meetings/ct11/>

Mathematical and Numerical Aspects of Waves Propagation (WAVES 2011), July 25 - 29.

Vancouver, BC, Canada. <http://www.sfu.ca/WAVES>

AUGUST 2011

ILAS Conference Pure and Applied Linear Algebra: The New Generation, August 22 - 26.

Braunschweig, Germany. <http://www.ilas2011.de>

EURO-PAR 2011, August 29 - September 2.

Bordeaux, France <http://europar2011.bordeaux.inria.fr/>

SEPTEMBER 2011

Numerical and analytical solution of stochastic delay differential equations, September 5 - 7.

Chester. <http://www.stochasticdelay.org.uk/>

4th International Workshop on Analysis and Numerical Approximation of Singular Problems, September 7 - 9.

Chester. <http://www.stochasticdelay.org.uk/>

International Conference on Parallel Processing and Applied Mathematics (PPAM 2011), September 11 - 14.

Torun, Poland. <http://ppam.pl>

MARCH 2012

5th International Conference on High Performance Scientific Computing, March 5 - 9.

Vietnam Academy of Science and Technology, Hanoi.

<http://hpsc.iwr.uni-heidelberg.de/HPSCHanoi2012>

9 Highlighted Conferences and Workshops

24th Biennial Conference on Numerical Analysis
(formerly Dundee Biennial Conference on Numerical Analysis)
June 28th to July 1st 2011, Strathclyde University, Glasgow, Scotland.

The conference is open to researchers in all areas of numerical analysis, and contributed talks by younger researchers, post-docs and research students are very welcome. Proposals for mini-symposia are particularly welcome and can be submitted on-line.

The following distinguished researchers have accepted invitations to deliver plenary lectures at the conference:

- Oscar Bruno (Caltech),
- Jack Dongarra (University of Tennessee),
- Chris Johnson (University of Utah)
- James Nagy (Emory University)
- Jorge Nocedal (Northwestern University)
- Djordje Peric (Swansea University)
- Alfio Quarteroni (EPF de Lausanne)
- Robert Schaback (Universitat Gottingen)
- Robert Skeel (Purdue University)
- Raul Tempone (KAUST)
- Nick Trefethen (University of Oxford)
- Barbara Wohlmuth (TU Munchen)

The A.R. Mitchell lecture will be presented by Prof. Quarteroni, and the after dinner speaker will be Prof. David Silvester (University of Manchester).

Early registration and booking is advised as on-campus accommodation is limited.

Further information and on-line registration may be found at <http://www.mathstat.strath.ac.uk/naconf>

Leverhulme International Network:
Numerical and analytical solution of stochastic delay differential equations
University of Chester, 5–7 September 2011.

The Leverhulme International Network, based in Chester and led by Professor Neville Ford, has been established for 3 years from 2008 to 2011, with the aim of bringing together experts from the areas of mathematical modelling, mathematical analysis, numerical and computational methods and stochastic analysis of functional differential equations.

Invited speakers will give 45 minute talks, there will also be opportunities for contributed talks. Proposals for contributed talks are encouraged (closing date: 15 July 2011).

For further scientific details contact Neville Ford (njford@chester.ac.uk) or for general details contact Marie-Anne O’Neil (m.oneil@chester.ac.uk).

Also see <http://www.stochasticdelay.org.uk/>

10 Summer Schools and Other Events

6th Postgraduate Numerical Analysis Day Oxford, 18 March 2011.

Oxford will host the 6th Postgraduate Numerical Analysis Day on Friday, 18 March 2011. The aim of the day is to give DPhil students a chance to present a talk to peers in a relaxed environment. The day is organised by students from the host university. Participating universities are Bath, Brunel, Cardiff, Imperial, Oxford and Reading. More information will be available during January/February 2011.

Email contact: lotti.ekert@maths.ox.ac.uk

Computational Challenges in PDEs Swansea, 4–8 April 2011.

The research programme on Computational Challenges for Partial Differential Equations was held at the Isaac Newton Institute (INI) in Cambridge between January and July in 2003. The programme resulted in important contributions in the fields of adaptivity and error control, the construction and mathematical analysis of multiscale numerical algorithms, the approximation of high-dimensional PDEs and the mathematical analysis of numerical algorithms for general PDEs.

Building on the success of this programme, the INI and the Wales Institute of Mathematical and Computational Sciences (WIMCS) are jointly organising a one week follow-up meeting in 2011. The meeting will consist of 32 invited contributions in the areas of multiscale modelling, interface modelling, PDEs on surfaces and geometric evolution problems, biomedical applications, computational rheology, atomistic to continuum passage, low order modelling and uncertainty modelling.

Further information may be found at http://www.wimcs.ac.uk/INI_Meeting.html

**10th Dobbiaco Summer School in Numerical Analysis
Bolzano, Italy, 12–17 June 2011.**

The topic of this summer school will be: Approximation Theory, Spectral Methods and Chebfun. Two leading specialists in the field Nick Trefethen (Oxford University) and Toby Driscoll (University of Delaware) will present a series of 90 minute-long lectures. The school is intended for PhD students and young researchers.

For pre-registration and further information, see <http://www.dmi.units.it/dobbiaco/> Please note that the number of participants is limited to 60.

Organizers: Alfredo Bellen (Trieste, Italy; bellen@units.it) Alexander Ostermann (Innsbruck, Austria)

**Special Semester on Multiscale Simulation and Analysis in Energy and the Environment
Johann Radon Institute for Computational and Applied Mathematics (RICAM)
Linz, October 3-December 16, 2011**

Technological advances have greatly improved our quality of life. However, they bring with them a huge surge in energy requirements which in turn puts at risk our entire bio-sphere. It is of paramount importance to predict these risks and to develop better solutions for the future. One of the central tasks is the accurate simulation of multiphase flow above and under ground. The risk analysis and uncertainty quantification, as well as the assimilation of data require statistical tools and efficient solvers for stochastic and deterministic PDEs as well as for the associated inverse problems. The key features that make it extremely hard to predict these physical phenomena accurately are the multiple time and length scales that arise, as well as the lack of and uncertainty in data. Because of the highly varying scales involved, the resolution of all scales is currently impossible even on the largest supercomputers. While there is a fairly long history of empirically successful robust computational techniques for certain multiscale problems, the rigorous (numerical) analysis of such methods is of extremely high current interest.

The goal of the special semester is to provide a stimulating environment for civil engineers, hydrologists, meteorologists and other environmental scientists to address together with mathematicians working at the cutting edge of rigorous numerical analysis for multiscale (direct and inverse) problems the emerging challenges in the quantitative assessment of the risks and uncertainties of atmospheric and subsurface flow, focusing in particular on

- Simulation of Flow in Porous Media and Applications in Waste Management and CO₂ Sequestration
- Large-Scale Inverse Problems and Applications in the Earth Sciences
- Data Assimilation and Multiscale Simulation in Atmospheric Flow
- Wave Propagation and Scattering, Direct and Inverse Problems and Applications in Energy and the Environment
- Multiscale Numerical Methods and their Analysis and Applications in Energy and the Environment
- Stochastic Modelling of Uncertainty and Numerical Methods for Stochastic PDEs

More details can be found at <http://www.ricam.oeaw.ac.at/specsem/specsem2011/>

11 Software News

News from NAG

Years of experience have taught me never to pre-announce news. After a few editions it is easy to find yourself forecasting events far into the future and there is always some smart reader ready and willing to point out exactly what had been promised. I shall therefore defer any discussion this year (2010) on the future content and availabilities of our libraries. Suffice to say however that I am hoping to be able to say more about them next time.

Instead I would like to put the spotlight on our NAG Library for .NET which has been released recently. Please see <http://www.nag.co.uk/numeric/DT/DTdescription.asp> for details.

This library follows the model used by the NAG Toolbox for MATLAB and consists of wrappers around some highly optimised Fortran code together with online documentation that fits naturally into that environment. The library makes routines from popular areas such as optimisation, statistics and quadrature and can be called in a very natural manner from C#, VB.NET, managed C++ and F# on both 32-bit and 64-bit platforms.

University users should be aware that, like our other libraries and toolboxes, the terms of their licences often allow them to install the library on their home machines. If you would like to do this please contact your site representative or NAG directly on support@nag.co.uk.

David Sayers (David.Sayers@nag.co.uk)

HECToR Training courses

HECToR training courses are provided by the NAG CSE team. The schedule for the next three months is:

- January 4-6. Imperial College London. Parallel Programming with MPI.
- January 11-12. Imperial College London. OpenMP.
- January 19-21. University of Bath. Parallel Programming with MPI.
- February 7. University of Warwick. Multicore.
- February 16-18. Imperial College London. Fortran 95.
- April 5. King's College London. Multicore.

Details are available at <http://www.hector.ac.uk/cse/training/>

12 PhD Theses

University of Edinburgh

Jonathan Hogg. High Performance Cholesky and Symmetric Indefinite Factorizations with Applications.

13 Vacant positions and studentships

Imperial College London : Reader/Chair in Numerical Analysis

Reader minimum salary: 52,400 GBP per annum

Chair/Professor minimum salary: 66,830 GBP per annum.

Applications are invited for a Readership in Numerical Analysis with effect from October 2011 or as soon as possible thereafter. All candidates will have research interests in an area of Numerical Analysis or a similar discipline at the interface between Applied Analysis and Scientific Computing.

It is anticipated that the successful applicant will have a track record of substantial, international research achievement in some area of Numerical Analysis, in a broad sense, including applied analysis, scientific computing and analysis of PDE. A PhD (or equivalent) in Mathematics or a related discipline is also a prerequisite. Experience of teaching at undergraduate and/or postgraduate level in applied and numerical analysis and/or scientific computing is essential. Strong leadership qualities are also required for this post, including a proven track record of securing research funding. It will be expected that the applicant has proven evidence of independent research activity and a good range of published work in peer-reviewed journals. Excellent verbal and written communication skills are essential for this post.

For appointment to Chair, candidates must also have an exceptionally strong research record in Numerical Analysis or a closely related discipline. In addition, candidates will be expected to have extensive experience in postgraduate teaching and undergraduate teaching across a range of subjects within the field of Numerical Analysis, together with an excellent track record of successful postgraduate student supervision and postdoctoral mentoring.

Further information about the department and the post can be found at the website <http://www.ma.imperial.ac.uk>. Our preferred method of application is online via the Imperial College Website www.imperial.ac.uk/employment. Further particulars for the post are available on the website

searching with the reference number NS2010204JH. Alternatively, if you are unable to apply online or have any queries about the application process please contact Mrs Maria Monteiro, m.monteiro@imperial.ac.uk

Closing date: 15 January 2011

University of Oxford: postdoctoral research positions

We invite applications for three postdoctoral research positions in applied and numerical mathematics at the Oxford Centre for Collaborative Applied Mathematics:

- Mathematical modelling of membrane filtration of water;
- A framework for hybrid discrete/continuous multiscale modelling of biological tissues;
- Brain mechanics, cortex folding, and pattern formation in growing tissues.

For details see <http://www.maths.ox.ac.uk/groups/occam/vacancies>. Closing dates are in early January.

Studentships are also available on: cell aggregate self-assembly, water purification, and defects in liquid crystals. Closing dates in early February, with more details available at the above URL.

Colin Macdonald (macdonald@maths.ox.ac.uk), University of Oxford.

Coventry University: PhD studentship

A PhD studentship in magnetoconvection at low magnetic Reynolds number is available in the Applied Mathematics Research Centre of Coventry University. The candidate must be an EU citizen. The Studentship Award comprises a Maintenance Grant of 12,867 GBP plus Home/EU fees equivalent.

The project concerns the study of instabilities in the buoyant convective flows in the presence of high magnetic fields. The work is mainly numerical, involving spectral methods using MATLAB. These methods developed previously for the flows in the absence of the magnetic field will need to be extended for the magnetic case and applied to the flow in an infinite layer of fluid with longitudinal temperature gradient. The mechanisms of instability for different wall conductivities, Hartmann numbers and orientation of the magnetic field and the layer need to be understood. The role of Alfvén waves in these flows is of particular interest.

For informal enquiries please contact Prof Sergei Molokov (s.molokov@coventry.ac.uk)

14 Postgraduate Courses

Please see the IMA NA Newsletter dated October 2010 (available at http://www.ima.org.uk/learned_soc/interestgroups.htm) for details of other courses.

Durham University

MSc in Biomathematics

The aim of the course is to bring students in twelve months to a position where they can start with confidence on a wide range of careers at the interface between Mathematics and Biology, including a PhD in an interdisciplinary area within the Biophysical Sciences Institute (BSI). The creation of the BSI in Durham in 2007 underpins a new approach to research in the life sciences, where the traditional academic distinctions between physicists, chemists, biologists, engineers and mathematicians are becoming increasingly irrelevant, and where significant progress is expected from learning from one another.

MSc in Mathematical Sciences

This is a one year advanced course aimed both at those students who wish to strengthen their knowledge with a view to continuing with a PhD and also at those who wish simply to take their studies further. Students specialise either in Mathematical Sciences or in Geometry and Physics.

MSc in Elementary Particle Theory

Because of its size and varied interests, the Centre for Particle Theory is able to offer a comprehensive programme of lectures in particle physics which take the student to the frontiers of present research. The course begins with a general survey of particle physics and introductory courses on quantum field theory and group theory. These lead onto more specialised topics, amongst others in string theory, cosmology,

supersymmetry and more detailed aspects of the standard model. For dissertations we offer students many topics of current interest to theoretical physics.

MSc by Thesis

The course length for an M.Sc. by thesis is normally 1 year (if full time) although students should perhaps allow some months' extra time for completing the writing up of your thesis. Students will undertake a course of study and research under the guidance of your supervisor. When this is complete they will write and submit a thesis (and, possibly, undergo a viva voce examination). The thesis may be entirely expository.

For more information, go to <http://www.dur.ac.uk/mathematical.sciences/postgrads/degrees/>

15 IMA Journal of Numerical Analysis

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Approximating piecewise-smooth functions
- 1184 S. A. SMITHEMAN, E. A. SPENCE and A. S. FOKAS
A spectral collocation method for the Laplace and modified Helmholtz equations in a convex polygon

- 1206 H. EGGER and J. SCHOBERL
A hybrid mixed discontinuous Galerkin finite-element method for convection diffusion problems
- 1235 B. LI and W. SUN
Newton Cotes rules for Hadamard finite-part integrals on an interval
- 1256 N. HOVHANNISYAN and S. MULLER
On the stability of fully adaptive multiscale schemes for conservation laws using approximate flux and source reconstruction strategies

16 New books

FINITE ELEMENTS

An Introduction to the Method and Error Estimation
Ivo Babuska, John Whiteman and Theofanis Strouboulis

Oxford University Press, November 2010 (336 pages).
ISBN 978-0-19-850669-0

Most of the many books on finite elements are devoted either to mathematical theory or to engineering applications, but not to both. This book seeks to bridge the gap by presenting the main theoretical ideas of the finite element method and the analysis of its errors in an accessible way. At the same time it presents computed numbers which not only illustrate the theory but can only be analysed using the theory. This approach, both dual and interacting between theory and computation makes this book unique.

Much research is currently being done into reliability in computational modelling, involving both validation of the mathematical models and verification of the numerical schemes. By treating finite element error analysis in this way this book is a significant contribution to the verification process of finite element modelling in the context of reliability.

Numerical Methods for Ordinary Differential Equations: Initial Value Problems

David F. Griffiths and Desmond J. Higham

Springer Undergraduate Mathematics Series, 2010, Paperback 271 pages, ISBN 0857291475, price: 45.95 (US dollars), 19.99 (GBP)

Written for undergraduate students with a mathematical background, this book focuses on the analysis of numerical methods for ODEs without losing sight of the practical nature of the subject. It covers the topics traditionally treated in a first course, but also highlights new and emerging themes, including error control, dynamical systems, modified equations, symplectic methods and stochastic differential equations. Chapters are broken down into 'lecture' sized pieces, motivated and illustrated by numerous theoretical and computational examples. Over 200 exercises are presented, with solutions available to authorized instructors.

More details at

<http://www.springer.com/mathematics/numerical+and+computational+mathematics/>

17 Acknowledgements

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